

Towers of Hanoi for 3 disks

Program starts at line 9, where $n = 3$

Next is Line 10:

TOH (3, A, B, C)

This now goes to line 1, and we execute TowerOfHanoi where $n = 3$, source = A, destination = B, and auxiliary = C)

Line 2 checks if $n == 1$

It does not, so we skip Lines 3 and 4

Line 5 says this (changing color so you can watch where we are):

TOH (n-1, source, auxiliary, destination)

Since $n = 3$, Line 5 will be:

TOH(3-1, A, C, B)

So now we go back to Line 1, and we execute TowerOfHanoi again with $n = 2$, source = A, destination = C, and auxiliary = B

Line 2 checks if $n == 1$

It does not because n is now 2, so we skip Lines 3 and 4

Line 5 says this:

TOH (n-1, source, auxiliary, destination)

Since n equals 2 now, this is what Line 5 will be:

TOH(2-1, A, B, C)

So now we go back to Line 1, and execute TowerOfHanoi again with $n = 1$, source = A, destination = B, and auxiliary = C

Line 2 checks if $n == 1$

It does!!

So now we move to Line 3, and execute the print statement:

“Move disk 1 from source A to destination B”

Then we hit Line 4

return

Where do we return?

We return to Line 5 that is in blue and go down to Line 6

This is a print statement, so we print out:

“Move disk 2 from source A to destination C”

Then we move down to Line 7:

TOH($n-1$, auxiliary, destination, source)

Remember, n is still set to 2 here.

Now we move back to Line 1, where $n = 1$, source = C, destination = B, and auxiliary = A

Line 2 checks if $n == 1$

It does!!

So now we move to Line 3, and execute the print statement:

“Move disk 1 from source C to destination B”

Then we hit Line 4

return

Where do we return?

We return to Line 7, and that completes the TowerOfHanoi execution for $n=2$

HOWEVER,

We still must finish the TowerOfHanoi execution for $n=3$ (moving back up the recursion, remember)

So now we are back at the print statement of Line 6, and $n=3$

“Move disk 3 from source A to destination B”

Then we move to Line 7

TOH(3-1, auxiliary, destination, source)

We jump back up to Line 1, where $n = 2$, source = C, destination = B, and auxiliary = A

Line 2 checks if $n == 1$

It does not, so we skip Lines 3 and 4

We are now at Line 5:

TOH (2-1, source, auxiliary, destination)

From here, we go back to Line 1, with $n = 1$, source = C, destination = A, and auxiliary = B

Line 2 checks if $n == 1$

It does!

So now we move to Line 3, and execute the print statement:

“Move disk 1 from source C to destination A”

Then we hit Line 4

return

Where do we return?

We return to Line 5 (which is in green) and execute Line 6 print statement:

“Move disk 2 from source C to destination B”

Time to go to Line 7

TOH (2-1, auxiliary, destination, source)

So now we go back to Line 1, where $n = 1$, $source = B$, $destination = A$, and $auxiliary = C$

Line 2 checks for $n == 1$

It does!!

We execute the print statement on Line 3

“Move disk 1 from source A to destination B”

Then we execute Line 4

return

Where do we return??

We now return to Line 7 (which is in **red**), which completes the TowerOfHanoi execution for $n = 3$

Since we finished with Line 10, the program is now done.